

## RESEARCH REPORT

# The relationship between stressful life situations and changes in alcohol consumption in a general population sample

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### Abstract

*Studies on the relationship between stressful life situations and alcohol consumption have almost exclusively been based on retrospective information from clinical populations. We conducted multiple regression analyses of the relationship between presumed stressful life conditions in 1965, life events during 1966-73 and psychosocial factors and amount of increase or decrease in alcohol consumption from 1965 to 1974 adjusting for age, alcohol consumption, education and health status in 1965. Data from surveys in 1965 and in 1974 in a general population sample of 4,864 subjects from Alameda County, California were used. The magnitude of the associations between the presumed stressful life situations and amount of change was generally low, although a few were statistically significant. However, among those aged 65 years and above, and especially among men, some of the associations were strong, but imprecise due to the low number of subjects in those ages. While a number of variables were associated with increase or decrease in alcohol consumption, the R<sup>2</sup>-values indicated that these variables explained little of the variation over time in alcohol consumption. Thus, people in general seem to cope with stressful life situations by means, other than a longstanding increase in alcohol consumption.*

### Introduction

Several theories suggest that there is a link between stressful situations and increases in alcohol consumption.<sup>1-4</sup> From a physiological perspective researchers have formulated the tension reduction hypothesis,<sup>3,4</sup> which posits that alcohol may be consumed to relieve anxiety or reduce tension. However, in a review by Cappel & Herman, they indicated that "Negative, equivocal and contradictory results are quite common if not prepon-

derant".<sup>4</sup> In a recent review some support was presented for a modified version of the tension reduction hypothesis, however it was based on only two studies.<sup>5</sup>

Results from experimental studies of humans are inconclusive. For example, Higgins & Marlatt reported that even though alcoholics drink more than social drinkers in the performance of an alcohol taste-rating task, the increased intake of the former group could not be attributed to anxiety induced by the investigators.<sup>6</sup> They concluded that there was little evidence that drinking constitutes a response to reduce anxiety. While early sociological ap-

proaches viewed problem drinking as a response to supposed psychological discomfort<sup>1,2</sup> and alcohol consumption as a means to relieve tension, and recent sociological research on alcohol consumption has been influenced by those early studies,<sup>7,8</sup> there is still little conclusive evidence.

Most studies on the relationship between stressful life situations and alcohol consumption have focused on clinical populations of alcoholics or problem drinkers under treatment, using retrospective information.<sup>9-11</sup> Many of those studies have reported that a substantial proportion of patients have attributed increases or decreases in alcohol consumption to various stressful life events. However, in a recent review, O'Doherty & Davies found important methodological weaknesses in the few studies on the relationship between life events and addictions.<sup>10</sup> The interpretation of attributions made by subjects under treatment for alcohol problems is problematic, as is the validity of retrospectively collected data.

Thus, the hypothesis of a relationship between stress and subsequent change in alcohol consumption is still unsettled. It is also unclear whether there are gender differences in the associations between stress and alcohol consumption.<sup>8-14</sup> Finally, even if there were a positive relation between stress and increase in consumption among those who are treated for problem drinking the relationship might be different in the general population.

This is a report of an analysis of a general population cohort, surveyed in both 1965 and 1974. We prospectively studied the relationship between presumed stressful conditions, life events and psychosocial factors and changes in alcohol consumption. Analyses examined the following questions.

- (1) Is there an association between stressful conditions, life events and subsequent changes in alcohol consumption?
- (2) If there is an association, how much of the changes in alcohol consumption in a population can this association account for?
- (3) Are there gender differences in this association?

### **Material and Methods**

The Human Population Laboratory (HPL) cohort was selected in 1965 from the non-institutionalized adult population of Alameda County, California, using area probability sampling methods<sup>15,16</sup>. The data collection utilized a self-administered questionnaire asking for detailed information regarding current health problems and functional disabilities,

daily living habits, social activities and relationships, attitudes and feelings about self, others and the world, and demographic information. Of the more than 8,000 designated respondents in 1965, completed questionnaires were received from 6,982, or 86%. In 1974, 4,864 (85%) of 5,714 located survivors completed a similar questionnaire as in 1965.<sup>16</sup>

### *Measure of alcohol consumption*

HPL respondents were asked how many times a week they usually drink each of the three types of alcoholic beverages (beer, wine, and 'spirits') and, for each kind that they ever drink, how many drinks they usually take at a sitting. The alcohol measure is computed by multiplying frequency by the number of drinks for each type of alcohol and summing the three scores to arrive at a total monthly consumption. Possible scores ranged from 0 to 270+ drinks per month, one drink corresponding to about 10 grams of 100% ethanol.<sup>17</sup> The same questions about alcohol consumption were used in the 1965 and in the 1974 survey. Change in consumption was calculated by subtracting the 1965 measures from the 1974 measure. Those with a change of five drinks or less per month were excluded from the analyses, to reduce the impact of small changes which are more likely to reflect random variation in reporting.

### *Measures of presumed stressful life conditions, life events and psychosocial factors*

We studied two categories of presumed stressors, namely stressful conditions reported in the 1965 questionnaire and life events occurring between 1966 and 1973, which were reported in the 1974 survey. In addition, we studied several psychosocial factors (depression, personal uncertainty, social isolation, life dissatisfaction, and dissatisfaction with financial situation), which might lower the threshold for stressful conditions. Those factors may also be associated with changes in alcohol consumption. The variables and their distribution in the 1965 sample are presented in Table 1. Most of those variables have been described in detail in other publications.<sup>15-21</sup> In this study the variables were generally dichotomized (Table 1). In general, the presumed low risk group was defined as the reference category.

Table 1. List of variables and their distribution in the sample

| Variable type  | Men  |      | Women |      |
|--|------|------|-------|------|
|  | n    | %    | n     | %    |
| (I) <i>Categorical adjustment variables</i>                                |      |      |       |      |
| Education  |      |      |       |      |
| 0-8 years  | 317  | 14.8 | 374   | 13.9 |
| 9-11 years   | 307  | 14.4 | 466   | 17.4 |
| 12 years   | 614  | 28.7 | 930   | 34.7 |
| 12+ years  | 898  | 42.0 | 912   | 34.0 |
| Self-perceived health<br>(fair/poor)                                       | 281  | 13.1 | 446   | 16.6 |
| Chronic conditions, 2-18/0-1   | 216  | 10.3 | 316   | 12.1 |
| Chronic symptoms, 2-9/0-1  | 481  | 23.9 | 989   | 28.6 |
| Problems with climbing<br>or feeding                                       | 119  | 5.6  | 316   | 12.1 |
| (II) <i>Presumed stressful conditions and psychosocial factors in 1965</i> |      |      |       |      |
| Marital status:  |      |      |       |      |
| unmarried  | 247  | 11.5 | 247   | 9.2  |
| divorced   | 97   | 4.5  | 276   | 10.2 |
| widow  | 30   | 1.4  | 196   | 7.3  |
| Marital strain   | 298  | 17.0 | 302   | 11.2 |
| Jobstrain  | 304  | 17.6 | 174   | 16.4 |
| Personal uncertainty   | 181  | 8.5  | 347   | 13.0 |
| Depression   | 205  | 9.6  | 402   | 15.0 |
| Non-membership in church group   | 1579 | 73.3 | 1819  | 67.9 |
| Non-membership in other groups   | 1603 | 74.4 | 1565  | 58.5 |
| Life dissatisfaction   | 241  | 11.3 | 356   | 13.3 |
| Social isolation   | 524  | 24.9 | 574   | 21.7 |
| Self-perceived isolation   | 471  | 22.4 | 624   | 23.8 |
| Social network index   |      |      |       |      |
| score 1 of 12 (lowest)   | 162  | 7.6  | 302   | 11.2 |
| score 2-5  | 634  | 29.6 | 989   | 36.8 |
| score 6-7  | 673  | 31.4 | 634   | 23.6 |
| score 8-12 (reference)   | 676  | 31.5 | 764   | 28.4 |
| Financial dissatisfaction  | 293  | 14.1 | 438   | 17.0 |
| (III) <i>Life events 1966-1973</i>   |      |      |       |      |
| Sexual problems  | 286  | 13.5 | 277   | 10.6 |
| Other marital problems   | 300  | 14.2 | 455   | 17.3 |
| Divorce  | 256  | 12.0 | 358   | 13.6 |
| Problems with steady date  | 78   | 3.7  | 133   | 5.1  |
| Death of spouse  | 73   | 3.4  | 199   | 7.6  |
| Death of own or in-law parents   | 621  | 29.2 | 767   | 29.1 |
| Death of other close relative  | 614  | 28.9 | 984   | 37.3 |
| Death of a close friend  | 465  | 21.9 | 740   | 28.1 |
| Job problems, self or spouse   | 510  | 24.0 | 574   | 21.8 |
| Losing a job, self or spouse   | 223  | 10.5 | 264   | 10.0 |
| Serious financial problems   | 295  | 13.9 | 450   | 17.1 |
| Deterioration of neighborhood  | 271  | 12.8 | 426   | 16.2 |

*Marital status.* Reference category was married.

*Marital strain.* This item was based on a score constructed from answers to eight questions, and dichotomized with the categories 9-22 versus 0-8 (reference).

*Job strain.* This item was based on a score constructed from answers to six questions, and dichotomized into the categories 15-22 versus 0-14 (reference).

*Personal uncertainty.* This variable was based on a score constructed from seven psychological items, dichotomized at 12-14 versus 7-11 (reference)<sup>16</sup>.

*Depression.* The measure of depression was based on 18 items indicative of depression and dichotomized at 5-18 versus 0-4 (reference category)<sup>19</sup>.

*Non-membership in church groups.* Current membership (reference category) was coded '0' and non-membership was coded '1'.

*Non-membership in other groups.* Current membership (reference category) was coded '0' and non-membership was coded '1'.

*Life dissatisfaction.* This item was constructed from a dichotomized score based on nine questions about an individual's satisfaction with life in general and particular aspects of life such as marriage, children and job. The score was dichotomized at 19-27 versus 9-18 (reference category)<sup>14</sup>.

*Social isolation.* This score was based on the questions: (1) How many close friends do you have? (2) How many relatives do you have that you feel close to? (3) How many of these friends do you see at least once a month? Those who selected the lowest category for at least two of the three questions were coded '1' as isolated, while the others constituted the reference category. Those who were coded as isolated reported four or less close friends or relatives seen at least once a month.

*Perceived social isolation.* Those with two affirmative answers to four psychological items were considered as perceiving themselves isolated, while the others constituted the reference category. The items were: (1) It's hard for me to feel close to others. (2) Often when I'm with a group of people, I feel left out, even if they are friends of mine. (3) I tend to keep people at a distance. (4) I often feel lonely or remote from other people.

*Social Network Index.* This measure was based on questions about marriage, number of contacts, number of intimate ties, church and group membership and thus includes some of the other items in the study<sup>20</sup>. The index has been found to be a good predictor of mortality<sup>21</sup>. Those with a comprehensive social network had score 12 and constituted the reference category.

*Financial dissatisfaction.* This variable was based on an additive score from four questions about self-perceived financial dissatisfaction and dichotomized 5-7 versus 0-4 (reference).

*Low adjusted family income.* This measures total family income divided by the number of persons in the household, and was divided into quintiles with the highest quintile serving as the reference group. In addition two summary scores were constructed.

*Strain score 1.* This was a count of the values of the dichotomized variables measuring: marital strain, job strain, depression, social isolation, self-perceived isolation, personal uncertainty and financial dissatisfaction.

*Strain score 2.* As strain score 1, but excluding jobstrain.

The measures of life events ( $n = 12$ ) items were based on questions in the 1974 survey about potentially negative events taking place between 1966 and 1973. The respondent was thus asked if specified life events had taken place between those 2 years. In addition to ascertainment of the individual life events, these summary scores were constructed:

*Event score 1.* This is a count score of the number of life events, similar to the strain score. It included all the 12 separate life events items in Table 1.

*Event score 2.* As event score 1, but excluding the two items job problems and losing a job.

*Event score 3.* As event score 2, but excluding the three variables associated with spouse (marital problems, divorce, death of spouse).

#### *Adjustment variables*

In all analyses we adjusted for age, alcohol consumption, education, and four measures of health status with data from the survey in 1965. Age and alcohol consumption were treated as continuous variables. Education was categorized into four groups: 0-8 years of grade school, 1-3 years of high school, high school graduate, and at least 1 year of college (reference group). The health status variables used were self-perceived health, chronic health conditions, symptoms of chronic conditions or diseases and physical functioning. The variable self-perceived health was based on the question "How do you rate your health?". The answers were dichotomized as 'poor or fair' versus 'good or excellent' (reference category). This variable has been found to be a predictor of 9 year all cause mortality<sup>21</sup>. The variables concerning chronic health conditions and symptoms included high blood pressure, chest pain, heart trouble, shortness of breath, bronchitis, diabetes, stroke, cancer, arthritis or rheumatism, stiff joints, back pain, gastritis, headache and swollen ankles, etc. Two or more chronic conditions/symptoms were coded '1' and 0-1 were coded '0'. The physical functioning variable was constructed from answers to two questionnaire items: trouble with feeding, dressing or moving about and trouble with climbing stairs and getting outdoors. Those who reported trouble with any of these activities were compared to those reporting none.

### *Analyses*

We conducted sex-specific analyses, separately, of those who increased and of those who decreased their alcohol consumption more than five drinks per month from 1965 to 1974, for those aged 20 years and over in 1965. Additionally, age-specific analyses were performed for three groups aged 20-44, 45-64 and 65 years or older. Because of the small numbers in the oldest age group, results are only presented for those variables where the number of subjects in a category was five or more. As it seemed possible that the impact of predictors was different for those with larger change in alcohol consumption we also performed analyses restricted to those who reported an increase or a decrease in alcohol consumption of at least one drink a day (30 drinks a month).

We performed separate multiple regression analyses for each of the stressor variables adjusted for age, alcohol consumption, education level and the four measures of health status mentioned above. Due to the skewed distribution of change in alcohol consumption we used the logarithm of increase and (absolute) decrease respectively as the outcome variables. For the non-dichotomized variables, we checked linearity of association by plotting mean log alcohol consumption against the value of the independent variable. The regression coefficient for each predictor was used to calculate the percentage difference in increase (decrease) corresponding to a unit difference in the predictor. For categorical variables, e.g. education level, this corresponds to the percentage difference between categories. The formula used was  $(\exp(\beta)-1) \times 100$ , where  $\beta$  is the regression coefficient. These values, together with 95% confidence intervals, are presented in Tables 2-7.

### **Results**

#### *Relationships for those who increased their alcohol consumption*

The relative (percentage) difference in increased consumption between the various categories and the reference category is presented in Table 2. For both sexes, those with an education level of 9-11 years, or 12 years, had significantly larger increases in consumption than those with more than 12 years of education. Among women, a significant increase was found in the lowest category of education (0-8 year). Age (inversely) and baseline alcohol consumption showed significant associations. None of the four measures of health status showed a

statistically significant association with increase with the exception of a marginal effect for problems with climbing/feeding for women.

The magnitude of the associations between presumed stressful conditions, life events and psychosocial factors, and increase in alcohol consumption, was generally rather low. (Table 2, model 2). The strongest effect, a difference of 32% (95% CI 13%, 53%) was found for men divorced during 1966-1973, compared to those who did not divorce. Job strain, strain score 1, problems with steady date and event score 1 were also associated with amount of increased consumption among men. Among women, a statistically significant positive association was found for being unmarried, a rather sparse social network, low family income and divorce during 1966-73. A few variables, more in women than in men, had a negative association with increase. The  $R^2$ -values were low for all models, being around 0.06-0.07 for men and 0.09-0.12 for women. Thus, even those variables which showed significant associations accounted for little of the variation in consumption.

We performed analyses of the same models and variables as in Table 2 for the age groups 20-44 years, 45-64 years and 65 years and above. Table 3 lists both the associations with a 50% or more difference between variable categories in increase in alcohol consumption, and/or the statistically significant associations, for the three age groups. Among men the magnitude of the associations were strongest for those aged 65 years and over. Few were statistically significant. Socially isolated older women had a 78% (95% CI 15%, 274%) larger increase in alcohol consumption than those who were not isolated. For men the difference between those isolated and those not isolated was even higher, but only four men at this age were socially isolated. The  $R^2$ -values were generally higher for the models for those aged 65 years and above, than for the other age groups, in most cases being between 0.15 and 0.30.

The magnitude of the associations was generally rather low in the other age groups (Table 3). There were no variable categories which showed an increase of 50% or more relative to the reference category in the ages 20-44 years and 45-64 years. There were more statistically significant associations among those aged 20-44 years than in the other age groups. Women aged 20-44 years in all income categories, compared to the highest, showed a positive and significant association to amount of increase.

**Table 2.** Associations between presumed stressful life conditions in 1965 and life events 1966-73 and log increase in alcohol consumption among those who increased 5 drinks per month or more, ages 20 years and above.\*

| Variables                       | Men<br>n = 813 |             | Women<br>n = 732 |              |
|---------------------------------|----------------|-------------|------------------|--------------|
|                                 | %              | 95% CI      | %                | 95% CI       |
| <b>Model 1</b>                  |                |             |                  |              |
| Age                             | -1.1           | (-1.5, 0.7) | -0.7             | (-1.1, -0.2) |
| Alcohol consumption             | 0.6            | (0.3, 0.8)  | 1.2              | (0.9, 1.5)   |
| Education                       |                |             |                  |              |
| 0-8 years                       | 13             | (-8, 38)    | 24               | (0, 53)      |
| 9-11 years                      | 39             | (17, 65)    | 18               | (1, 38)      |
| 12 years                        | 17             | (3, 32)     | 21               | (8, 35)      |
| Self-perceived health           | 2              | (-15, 23)   | 2                | (-13, 22)    |
| Chronic conditions 2-18/0-1     | 16             | (-15, 59)   | -9               | (-29, 17)    |
| Chronic symptoms 2-9/0-1        | 1              | (-12, 16)   | 10               | (-2, 23)     |
| Problems with climbing/feeding  | 2              | (-27, 36)   | -22              | (-39, 1)     |
| <b>Model 2</b>                  |                |             |                  |              |
| Unmarried/married               | -6             | (-13, 12)   | 22               | (2, 32)      |
| Divorced/married                | 9              | (-9, 32)    | -10              | (-37, 27)    |
| Widower/married                 | -5             | (-27, 24)   | -21              | (-56, 39)    |
| Marital strain                  | 9              | (-7, 27)    | -11              | (-23, 4)     |
| Jobstrain                       | 18             | (1, 38)     | 14               | (-8, 43)     |
| Personal uncertainty            | 10             | (-10, 35)   | 7                | (-8, 26)     |
| Depression                      | -8             | (-26, 15)   | 0                | (-14, 17)    |
| Non-membership in church groups | 11             | (-1, 25)    | 6                | (-7, 21)     |
| Non-membership in other groups  | 1              | (-9, 12)    | -6               | (-17, 7)     |
| Life dissatisfaction            | 0              | (-2, 2)     | 0                | (-2, 2)      |
| Social isolation                | 11             | (-2, 26)    | -2               | (-13, 11)    |
| Self-perceived isolation        | 4              | (-9, 10)    | -3               | (-14, 9)     |
| Social network index            |                |             |                  |              |
| score 1/score 8-12              | 18             | (-1, 42)    | -4               | (-23, 21)    |
| score 2-5/score 8-12            | 2              | (-10, 16)   | 17               | (1, 35)      |
| score 6-7/score 8-12            | 12             | (-2, 29)    | 8                | (-6, 23)     |
| Financial dissatisfaction       | 15             | (-2, 35)    | -3               | (-16, 12)    |
| Family income, adjusted         |                |             |                  |              |
| quintile 1/quintile 5           | 8              | (-11, 30)   | 25               | (5, 36)      |
| 2/                              | 8              | (-9, 29)    | 13               | (-3, 33)     |
| 3/                              | 1              | (-15, 20)   | 7                | (-9, 26)     |
| 4/                              | -2             | (-19, 18)   | 7                | (-9, 26)     |
| Strain score 1 (7 items)        | 9              | (2, 17)     | -3               | (-11, 6)     |
| Strain score 2 (6 items)        | 7              | (-1, 15)    | -2               | (-8, 5)      |
| Sexual problems                 | 15             | (-2, 35)    | 9                | (-5, 27)     |
| Other marital problems          | 5              | (-9, 22)    | 5                | (-7, 19)     |
| Problems with steady date       | 28             | (0, 63)     | 13               | (-8, 39)     |
| Divorce                         | 32             | (13, 53)    | 17               | (2, 35)      |
| Death of spouse                 | 18             | (-13, 61)   | 10               | (-12, 39)    |
| Death of own/in-law parents     | -10            | (-20, 11)   | 5                | (-5, 17)     |
| Death of other close relative   | 1              | (-6, 13)    | -1               | (-11, 10)    |
| Death of a close friend         | -7             | (-19, 6)    | 5                | (-7, 12)     |
| Job problems, self or spouse    | 11             | (-2, 26)    | 6                | (-6, 19)     |
| Losing a job, self or spouse    | 2              | (-13, 20)   | 5                | (-12, 25)    |
| Serious financial problems      | 20             | (-3, 40)    | 10               | (-4, 25)     |
| Deterioration of neighbourhood  | -1             | (-16, 17)   | -9               | (-21, 26)    |
| Event score 1 (12 items)        | 4              | (0, 7)      | 2                | (-1, 5)      |
| Event score 2 (10 items)        | 4              | (-1, 8)     | 3                | (-1, 7)      |
| Event score 3 (7 items)         | 2              | (-3, 7)     | 2                | (-2, 7)      |

\* Percentage difference between each category and the reference category, with 95% confidence intervals (CI) in multiple regression analyses. Model 1 contains the adjustment variables only. Model 2 contains the adjustment variables and each variable separately.

Table 3. Independent variables having statistically significant and/or strong<sup>1</sup> associations with log increase in alcohol consumption, by age group.<sup>2</sup>

| Variables  | Men |             | Women |           |
|--|-----|-------------|-------|-----------|
|  | %   | 95% CI      | %     | 95% CI    |
| <i>Ages 20-44 years</i><br>(n = 563 men and 508 women) |     |             |       |           |
| Marital strain   | 9   | (1, 18)     |       |           |
| Jobstrain  | 24  | (3, 50)     |       |           |
| Non-membership in church groups                        | -7  | (-11, -2)   |       |           |
| Financial dissatisfaction                              | 23  | (2, 44)     |       |           |
| Strain 1 (7 items)                                     | 9   | (1, 18)     |       |           |
| Family income, adjusted quintile 1 (lowest)            |     |             | 38    | (9, 71)   |
| 2  |     |             | 23    | (1, 51)   |
| 3  |     |             | 25    | (1, 55)   |
| 4  |     |             | 30    | (4, 64)   |
| Divorce 1966-73  | 32  | (13, 54)    | 18    | (1, 39)   |
| Serious financial problems                             | 21  | (2, 43)     |       |           |
| Event score 1 (12 items)                               | 6   | (2, 10)     | 3     | (1, 7)    |
| <i>Ages 45-64 years</i><br>(n = 222 men and 185 women) |     |             |       |           |
| Event score 3  | -9  | (-18, -1)   |       |           |
| Death of a friend                                      | -26 | (-40, -8)   |       |           |
| <i>Ages 65+ years</i><br>(n = 39 men and 28 women)     |     |             |       |           |
| Social isolation                                       |     |             | 78    | (15, 274) |
| Strain 2   | 429 | (52, 1218)  |       |           |
| Death of other close relative                          | 426 | (-49, 3592) |       |           |
| Non-membership in church groups                        | 61  | (-88, 22)   |       |           |

<sup>1</sup>Associations showing difference of 50% or more between a category of a variable and the reference category.

<sup>2</sup>Multiple regression analyses with each independent variable adjusted for age, alcohol consumption, education and health status in 1965. Percentage difference between a category and the reference category, with 95% confidence intervals (CI).

The magnitude of the associations between various factors and an increase in alcohol consumption among those who increased 30 drinks or more per month (Table 4) was generally on the same level as for those who increased five drinks or more per month, but the number of statistically significant associations was greater. The R<sup>2</sup>-values were around 0.02 in women and around 0.10 in men.

*Relationships for those who decreased their alcohol consumption*

The percentage difference in change for various categories among those who decreased their consumption by more than five drinks per month is depicted in Table 5. An educational level of 0-8 years and 9-11 years, compared to over 12 years, was associated with a significant decrease in amount

of alcohol consumption in both sexes (Table 5, model 1). Baseline alcohol consumption also showed a statistically significant association, as well as chronic health conditions in men.

The magnitude of the percentage decrease in alcohol consumption associated with the presumed stressful conditions and life events, was generally rather low in models with each separate variable and the adjustment variables (Table 5). A social network score of 2-5, compared to a score of 8-12 and a report of sexual problems showed a statistically significant association with amount of decrease among men. The R<sup>2</sup>-values were very high in all models for both sexes, being around 0.55-0.60. This was true also in the model with only the adjustment variables, indicating that most of the predictability is based on the adjustment variables.

Table 6 depicts the associations with a 50% or

**Table 4.** Independent variables having statistically significant associations and/or strong<sup>1</sup> associations with log increase in alcohol consumption, among those who increased 30 drinks per month or more, ages 20 years and above.<sup>2</sup>

| Variables                               | Men<br>n = 281 |           | Women<br>n = 145 |         |
|---|----------------|-----------|------------------|---------|
|   | %              | 95% CI    | %                | 95% CI  |
| Marital strain                          | 9              | (3, 16)   |                  |         |
| Personal uncertainty                    | 16             | (2, 32)   |                  |         |
| Non-membership in<br>other groups       | -12            | (-22, -1) |                  |         |
| Social isolation                        | 15             | (2, 30)   |                  |         |
| Family income,<br>quintile 1/quintile 5 | 22             | (1, 31)   |                  |         |
| Strain 1                                | 9              | (3, 16)   |                  |         |
| Strain 2                                | 8              | (2, 15)   |                  |         |
| Sexual problems                         |                |           | 21               | (2, 43) |
| Problems with steady date               | 40             | (13, 74)  |                  |         |
| Serious financial problems              |                |           | 20               | (2, 39) |
| Divorce 1966-73                         | 17             | (3, 33)   |                  |         |
| Event score 1                           | 3              | (0, 6)    | 4                | (0, 7)  |
| Event score 2                           |                |           | 6                | (2, 11) |
| Event score 3                           |                |           | 5                | (1, 9)  |

<sup>1</sup>Associations showing a difference of 50% or more between a category of a variable and the reference category.

<sup>2</sup>Multiple regression analyses with each independent variables adjusted for age, alcohol consumption, education and health status in 1965. Percentage difference between a category and the reference category, with 95% confidence intervals (CI).

more difference between variable categories in decrease in alcohol consumption, and/or those which had a statistically significant association with amount of decrease, distributed by age. The strongest associations were found in the ages 65 years and above, especially among men. The  $R^2$ -values were around 0.60 for those aged 65 years or over in many such models. There were no variable categories which showed a 50% or more difference in decrease in the aged 20-44 years and 45-64 years, although some of the associations were statistically significant.

A low social network score and financial dissatisfaction were positively associated, and a low family income was negatively associated with amount of decrease among men aged 20-44 years. There was also a significant and positive association between being divorced in 1965 and a decrease in consumption among females aged 20-44 years. Among those aged 45-64 years there was a positive association between amount of decrease and measures of strain in both sexes, and for low or moderate family income in women. Table 7 depicts the statistically significant associations among those who decreased by 30 drinks or more per month.

## Discussion

On a conceptual level, it is important to stress that the presumed stressful conditions in 1965 can be regarded as predictors of change in alcohol consumption between 1965 and 1974, while this is not valid for the life events. A causal interpretation is possible for an association between a condition in 1965 and a subsequent change. However, this is not possible for the relationship between life events and change in alcohol consumption, since we lack information about the time ordering.

A major finding for the entire age range was that the associations between presumed stressful life conditions in 1965, life events during 1966-73, psychosocial factors and amount of change in alcohol consumption were generally small. The low magnitude of the associations and the small difference in  $R^2$ -values in models with and without adjustment variables indicate that factors other than stressful conditions, events and psychosocial factors were of much greater importance as predictors of change.

However, among those aged 65 years and above, the magnitude of the associations were rather strong for some variables. Mainly due to the small numbers



Table 5. Associations between stressful life conditions in 1965 and life events 1966-73 and log decrease in alcohol consumption among those who decreased five drinks a month or more, ages 20 years and above.\*

| Variable                        | Men<br>n = 813 |             | Women<br>n = 732 |             |
|---------------------------------|----------------|-------------|------------------|-------------|
|                                 | %              | 95% CI      | %                | 95% CI      |
| Difference                      |                |             |                  |             |
| <b>Model 1</b>                  |                |             |                  |             |
| Age                             | -0.3           | (-0.7, 0.1) | -0.2             | (-0.6, 0.2) |
| Alcohol consumption             | 1.5            | (1.3, 1.6)  | 1.8              | (1.7, 1.9)  |
| Education                       |                |             |                  |             |
| 0-8 years                       | 23             | (6, 43)     | 18               | (2, 37)     |
| 9-11 years                      | 24             | (9, 41)     | 16               | (2, 31)     |
| 12 years                        | 1              | (-10, 13)   | 9                | (-1, 20)    |
| Self-perceived health           | 5              | (-10, 22)   | 6                | (-7, 20)    |
| Chronic conditions 2-18/0-1     | -21            | (-36, -3)   | 10               | (-8, 30)    |
| Chronic symptoms 2-9/0-1        | 10             | (-2, 24)    | -7               | (-15, 2)    |
| Problems with climbing/feeding  | 9              | (-11, 34)   | 9                | (-5, 25)    |
| <b>Model 2</b>                  |                |             |                  |             |
| Unmarried/married               | 12             | (-3, 29)    | -1               | (-14, 14)   |
| Divorced/married                | 8              | (-10, 27)   | 8                | (-5, 22)    |
| Widow/married                   | -4             | (-37, 48)   | 16               | (-4, 40)    |
| Marital strain                  | -1             | (-13, 12)   | 10               | (-2, 24)    |
| Jobstrain                       | 10             | (-3, 26)    | 7                | (-13, 32)   |
| Personal uncertainty            | 8              | (-7, 26)    | 2                | (-10, 14)   |
| Depression                      | -8             | (-21, 8)    | -8               | (-19, 4)    |
| Life dissatisfaction            | 13             | (-1, 29)    | 6                | (-4, -19)   |
| Non-membership in church groups | -3             | (-15, 8)    | 6                | (-3, 15)    |
| Non-membership in other groups  | 2              | (-8, 11)    | -1               | (-10, 8)    |
| Financial dissatisfaction       | 8              | (-6, 24)    | 6                | (-6, 18)    |
| Social isolation                | -10            | (-1, 22)    | -2               | (-11, 8)    |
| Self-perceived isolation        | 4              | (-7, 16)    | 2                | (-7, 12)    |
| Social network index            |                |             |                  |             |
| score 1/score 8-12              | 16             | (-2, 38)    | -1               | (-15, 14)   |
| score 2-5/score 8-12            | 14             | (1, 29)     | 1                | (-9, 12)    |
| score 6-7/score 8-12            | 10             | (-2, 16)    | -4               | (-13, 8)    |
| Family income, adjusted         |                |             |                  |             |
| quintile 1/quintile 5           | 11             | (-5, 30)    | 13               | (-1, 30)    |
| quintile 2/quintile 5           | -7             | (-21, 7)    | 17               | (2, 33)     |
| quintile 3/quintile 5           | 1              | (-12, 17)   | 5                | (-8, 20)    |
| quintile 4/quintile 5           | -4             | (-17, 11)   | 9                | (-5, 24)    |
| Strain 1 (7 items)              | 5              | (-1, 10)    | 8                | (-2, 19)    |
| Strain 2 (6 items)              | 1              | (-5, 7)     | 3                | (-2, 9)     |
| Sexual problems                 | 15             | (1, 31)     | -5               | (-16, 8)    |
| Other marital problems          | 9              | (-5, 25)    | -7               | (-17, 4)    |
| Problems with steady date       | -20            | (-37, 2)    | 11               | (-7, 33)    |
| Divorce                         | -1             | (-15, 14)   | -5               | (-14, 6)    |
| Death of spouse                 | 7              | (-19, 41)   | 1                | (-14, 18)   |
| Death of own/in-law parents     | -6             | (-15, 4)    | 1                | (-7, 11)    |
| Death of other close relative   | -6             | (-14, 6)    | -2               | (-11, 8)    |
| Death of a close friend         | 4              | (-7, 16)    | -3               | (-11, 7)    |
| Job problems, self or spouse    | -6             | (-16, 6)    | -2               | (-11, 8)    |
| Losing a job, self or spouse    | -8             | (-20, 7)    | 3                | (-10, 17)   |
| Serious financial problems      | 7              | (-6, 22)    | 11               | (-1, 24)    |
| Deterioration of neighbourhood  | 3              | (-10, 19)   | -9               | (-3, 16)    |
| Event score 1 (12 items)        | 0              | (-3, 3)     | 0                | (-2, 2)     |
| Event score 2 (10 items)        | 1              | (-3, 4)     | 0                | (-3, 3)     |
| Event score 3 ( 7 items)        | 0              | (-2, 2)     | 0                | (-3, 3)     |

\* Percentage difference between each category and the reference category, with 95% confidence intervals (CI) in multiple regression analyses. Model 1 contains the adjustment variables only. Models 2 contain the adjustment variables and each variable separately.

**Table 6.** Independent variables having statistically significant and/or strong<sup>1</sup> associations with log decrease in alcohol consumption, by age group.<sup>2</sup>

| Variables  | Men |            | Women |           |
|--|-----|------------|-------|-----------|
|  | %   | 95% CI     | %     | 95% CI    |
| <i>Ages 20-44 years</i><br>(n = 344 men and 314 women) |     |            |       |           |
| Divorced in 1965                                       |     |            | 19    | (2, 38)   |
| Social network index,<br>score 1/8-12                  | 26  | (2, 57)    |       |           |
| Financial dissatisfaction                              | 25  | (5, 49)    |       |           |
| Family income, adjusted<br>quintile 2/quintile 5       | -22 | (-6, -35)  |       |           |
| <i>Ages 45-64 years</i><br>(n = 203 men and 169 women) |     |            |       |           |
| Strain 1   | 11  | (0, 22)    | 32    | (2, 70)   |
| Strain 2   | 12  | (1, 23)    |       |           |
| Family income, adjusted<br>quintile 1/quintile 5       |     |            | 39    | (4, 87)   |
| quintile 3/quintile 5                                  |     |            | 34    | (4, 72)   |
| quintile 4/quintile 5                                  |     |            | 30    | (4, 61)   |
| <i>Ages 65+ years</i><br>(n = 39 men and 45 women)     |     |            |       |           |
| Non-membership in<br>other groups                      |     |            | -29   | (-9, -79) |
| Social isolation                                       | 54  | (-18, 289) |       |           |
| Family income, adjusted<br>quintile 1/quintile 5       | 90  | (-10, 402) |       |           |

<sup>1</sup>Associations showing a difference of 50% or more between a category of a variable and the reference category.

<sup>2</sup>Multiple regression analyses with each variable adjusted for age, alcohol consumption, education and health status in 1965. Percentage differences between a category and the reference category, with 95% confidence intervals (CI).

**Table 7.** Independent variables having statistically significant and/or strong<sup>1</sup> associations with log decrease in alcohol consumption, among those who decreased 30 drinks per month or more, ages 20 years and above.<sup>2</sup>

| Variables                      | Men<br>n = 248 |           | Women<br>n = 81 |           |
|--------------------------------|----------------|-----------|-----------------|-----------|
|                                | %              | 95% CI    | %               | 95% CI    |
| Social network<br>score 1/8-12 | 27             | (6, 51)   |                 |           |
| Problems with steady date      | -24            | (-39, -6) |                 |           |
| Death of spouse                |                |           | -24             | (-39, -7) |

<sup>1</sup>Associations showing a difference 50% or more between a category of a variable and the reference category.

<sup>2</sup>Multiple regression analyses with each independent variable adjusted for each; alcohol consumption, education and health status in 1965. Percentage difference between a category and the reference category, with 95% confidence intervals (CI).

few of the associations were statistically significant (Tables 3 and 6). This was true for both those who increased and for those who decreased. This is indicated by the much higher  $R^2$ -values in many models for those aged 65 years and above, than in models for those who were younger. It is quite possible that the impact of stressful conditions and life events and change in alcohol consumption is stronger in those ages, especially among those who increase their consumption. If that is the case, measures to reduce stress and social isolation among the elderly might have a beneficial impact on alcohol consumption and health in general. However, the results must be interpreted with special caution due to the low numbers among those aged 65 years and above. The higher number of statistically significant weaker associations in those aged 20-44 years, may be explained by the higher number of subjects in those ages, and perhaps, less variability.

Items measuring various aspects of a relationship to spouse or other person of the opposite sex (marital strain, divorce, sexual problems, death of spouse) showed stronger and more statistically significant associations to increase among men than among women. On the whole we found a tendency for stronger associations between stressful conditions and life events among men than among women, as did Morrisey in her study of men and women under treatment for alcohol problems.<sup>9</sup> However, studies of clinical populations have usually indicated that women more often report stressful events in the relation to a man as a reason to start drinking.<sup>9-13</sup> It is interesting to note that Cooke & Allan found no correlation between stressful life events and alcohol abuse in women.<sup>22</sup> In a recent report Gorman & Peters found a distinct association between stressful life events and the onset of alcohol dependence in both sexes among male and female patients at a district hospital.<sup>11</sup> However, due to differences in populations,<sup>9,10,23</sup> time spans and methods our results are not easily comparable to results from retrospective studies of clinical samples.

The magnitude of the associations were also rather low among those who increased at least one drink or more per day (Table 4). The higher number of statistically significant associations especially among men implies that stressful conditions and life events may be of importance for the increase in this group with a higher proportion of high consumers.

For those who decreased their alcohol consumption, the magnitude of the associations were gener-

ally also weak. The exception was for those aged 65 years and above where stronger associations were seen. The number of statistically significant associations was highest in the ages 20-44 years. The associations were weak for those who decreased their alcohol consumption with 30 drinks or more per month (Tables 5-7). The  $R^2$ -values were much higher than those found in the analyses of increased consumption, but most of the explained variation could be attributed to the adjustment variables.

In many cases, the same variable was associated with both increase or decrease in alcohol consumption. For example, among women, low family income was associated significantly with both magnitude of increase and magnitude of decrease (Tables 2 and 4). Similarly, the amount of change in consumption was greater among those with a low or moderate education, both for increasers and decreasers. This indicates that some of the associations were non-specific, and many of them were rather weak.

The inverse association between age and increase in alcohol consumption is consistent with all the data showing that consumption is highest in the ages 20-24 years and then generally decreases.<sup>24</sup>

The finding that alcohol consumption in 1965 predicted both amount of increase and decrease can to a considerable extent be attributed to 'regression to the mean'.<sup>25</sup> Average alcohol consumption in 1965 in our sample was 25 drinks per month among male increasers and 56 drinks among decreasers, while the corresponding figures for females were 15 and 35 drinks respectively. The correlation coefficient between consumption in 1965 and in 1974 was 0.67 for men and 0.74 for women. Knibbe *et al.*<sup>26</sup> and Temple *et al.*<sup>27</sup> also report a high correlation between alcohol consumption at time 1 and at time 2 in cohort studies.

The validity of self-reported data about alcohol consumption can always be questioned.<sup>28</sup> There are some deficiencies in this 'usual frequency  $\times$  usual quantity' measure. It is somewhat imprecise in terms of ethanol consumed since subjects were asked only 'how many drinks' of each type consumed rather than how many ounces of alcohol. The questions about drinking had precoded response categories, which imposed an artificial upper limit of reported consumption for each type of beverage (five or more drinks per sitting, two or more sittings per week). Later studies have demonstrated that the reported alcohol consumption will become higher if questions about occasions with a special high intake are included.<sup>28</sup> However, we have no reason to

believe that there was a general change in validity between the surveys in 1965 and 1974.

Our strain and events scores are simple count scores of the number of stressors reported. There are different opinions about assignments of weights to individual life events when constructing scores. Several investigators have concluded that this is unnecessary and that a simple count of the number of events experienced by an individual is an adequate measure of the magnitude of life changes.<sup>9,29</sup>

The 9 year period between the first and second surveys may also have made it difficult to detect associations in this study.

If the impact of presumed stressful conditions, life events and psychosocial factors on alcohol consumption occurs quickly and dissipates over time, then we might have found stronger associations in our analyses, if we had been able to use a considerably shorter time span.

The validity of our results is generally strengthened by the study design—a prospective, longitudinal study of a large randomly selected general population cohort with high participation, and with the questions about stressors not connected to questions about alcohol consumption. Many of the variables have been carefully analyzed and discussed in other papers.<sup>15-21</sup>

In conclusion, we found little indication that stressful life conditions, life events and psychosocial factors are importantly associated with change in alcohol consumption. From a public health perspective, the results indicate that people in general seem to cope with or adjust to stressful conditions and life events by means other than a longstanding increase in alcohol consumption. Other factors such as environmental restrictions and pricing seem to be more important in predicting change in consumption in natural populations.<sup>30,31</sup>

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